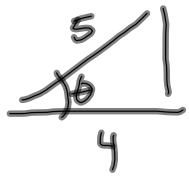
23



$3 \frac{rad}{min} = \frac{d\theta}{dt}$

what rate . . .

find $\frac{dx}{dt}$

$\sin\theta = \frac{x}{5}$ SOH

$5\sin\theta = x$

$5\cos\theta \frac{d\theta}{dt} = \frac{dx}{dt}$

CAH

$5 \cdot \frac{4}{5} \cdot 3 = \frac{dx}{dt}$

$12 = \frac{dx}{dt}$

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24.

$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} \ldots$

$f'(x) = \sin x^2$

$f'(x) = x^2 - \frac{x^6}{3!} + \frac{x^{10}}{5!} \ldots$

$f(x) = \frac{x^3}{3} - \frac{x^7}{7 \cdot 3!} \ldots$

$\frac{-1}{7 \cdot 3!} = -\frac{1}{42}$

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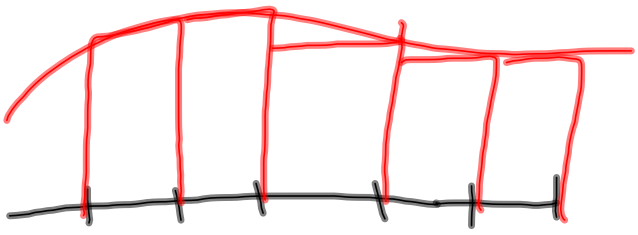
25.



$a = x_0 \quad x_1 \quad x_2 \cdots \quad x_n = b$

$$\lim_{n\to\infty} \sum_{i=1}^{n} \sqrt{x_i}\,\Delta x = \int_a^b \sqrt{x}\,dx$$

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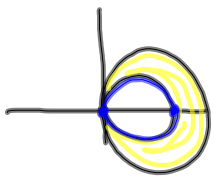
21.

in out

$r = 2\cos\theta \qquad r = \cos\theta$



θ	r
0	1
$\frac{\pi}{2}$	0
π	-1

$$\int \tfrac{1}{2}R^2 - \tfrac{1}{2}r^2\,d\theta$$

$$\tfrac{1}{2}\int_0^{\pi} (2\cos\theta)^2 - (\cos\theta)^2\,d\theta$$

$$\tfrac{1}{2}\int_0^{\pi} 3\cos^2\theta\,d\theta$$

$$\tfrac{3}{2}\int_0^{\pi} \cos^2\theta\,d\theta$$

$$\tfrac{3}{2}\int_0^{\pi/2} \cos^2\theta\,d\theta$$

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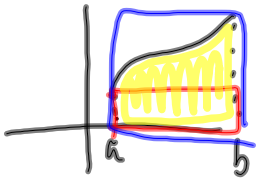
Review 18 Properties & applications of def. integrals

p179 & p 180

$$\int_a^b = -\int_b^a$$

$$\min f \cdot (b-a) \le \int_a^b f(x)\,dx \le \max f \cdot (b-a)$$



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applications

$$\int_a^b f(x)\,dx = \text{net area}$$

area between 2 curves: $\int_a^b f(x) - g(x)\,dx$ (upper − lower)

arc length: $\int_a^b \sqrt{1+\left(\frac{dy}{dx}\right)^2}\,dx$

or $\int_c^d \sqrt{1+\left(\frac{dx}{dy}\right)^2}\,dy$

or $\int_{t_1}^{t_2} \sqrt{\left(\frac{dx}{dt}\right)^2+\left(\frac{dy}{dt}\right)^2}\,dt$

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Volumes d.a.p.d.i.

1 choice: horiz or vert rect.
dy dx

disk $\int_c^d \pi r^2\,dy$ $\int_a^b \pi r^2\,dx$

washers $\int_c^d \pi R^2 - \pi r^2\,dy$ $\int_a^b \pi R^2 - \pi r^2\,dx$

shells $\int_c^d 2\pi r h\,dy$ $\int_a^b 2\pi r h\,dx$

Volume of known cross section

$\int_a^b$ Area of cross section dx ⊥ to x axis

$\int_c^d$ area ... dy ⊥ y axis

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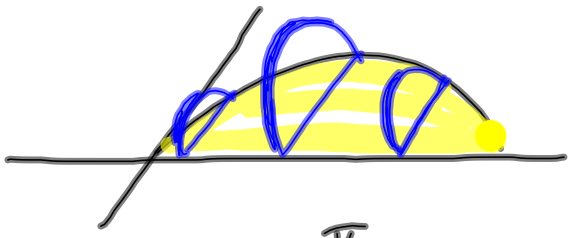
base: 1 arch of $\sin x$

cross sections: semicircles ⊥ x-axis



$$\int_0^{\pi} \frac{1}{2}\pi\left(\frac{1}{2}\sin x\right)^2 dx$$

$\frac{1}{2}\pi r^2$

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